

Preliminary Classification:

Proposed Class:

Subclass:

NOTE: "All applicants are requested to include a preliminary classification on newly filed patent applications. The preliminary classification, preferably class and subclass designations, should be identified in the upper right-hand corner of the letter of transmittal accompanying the application papers, for example 'Proposed Class 2, subclass 129.'" M.P.E.P. § 601, 7th ed.

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Box Patent Application  
Assistant Commissioner for Patents  
Washington, D.C. 20231

## NEW APPLICATION TRANSMITTAL

Transmitted herewith for filing is the patent application of

Inventor(s): Antero LUNDELL, Lars DALSGAARD

**WARNING:** 37 C.F.R. § 1.41(a)(1) points out:

"(a) A patent is applied for in the name or names of the actual inventor or inventors.

"(1) The inventorship of a nonprovisional application is that inventorship set forth in the oath or declaration as prescribed by § 1.63, except as provided for in § 1.53(d)(4) and § 1.63(d). If an oath or declaration as prescribed by § 1.63 is not filed during the pendency of a nonprovisional application, the inventorship is that inventorship set forth in the application papers filed pursuant to § 1.53(b), unless a petition under this paragraph accompanied by the fee set forth in § 1.17(f) is filed supplying or changing the name or names of the inventor or inventors."

For (title): METHOD OF CELL RE-SELECTION, AND NETWORK PART, AND SUBSCRIBER TERMINAL

**CERTIFICATION UNDER 37 C.F.R. § 1.10\***

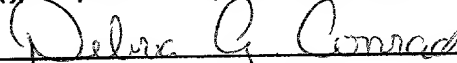
(Express Mail label number is mandatory.)

(Express Mail certification is optional.)

I hereby certify that this New Application Transmittal and the documents referred to as attached therein are being deposited with the United States Postal Service on this date October 15, 1999, in an envelope as "Express Mail Post Office to Addressee," mailing Label Number EL336861314US, addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231.

Debra G. Conrad

(type or print name of person mailing paper)



Signature of person mailing paper

**WARNING:** Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. § 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.

**\*WARNING:** Each paper or fee filed by "Express Mail" must have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. § 1.10(b).

"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will not be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.

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10/15/99  
JC714 U.S. PTO

10/15/99  
09/419171  
JC503 U.S. PTO

## 1. Type of Application

This new application is for a(n)

(check one applicable item below)

- ☒ Original (nonprovisional)  
☐ Design  
☐ Plant

**WARNING:** Do not use this transmittal for a completion in the U.S. of an International Application under 35 U.S.C. § 371(c)(4), unless the International Application is being filed as a divisional, continuation or continuation-in-part application.

**WARNING:** Do not use this transmittal for the filing of a provisional application.

**NOTE:** If one of the following 3 items apply, then complete and attach **ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF A PRIOR U.S. APPLICATION CLAIMED** and a **NOTIFICATION IN PARENT APPLICATION OF THE FILING OF THIS CONTINUATION APPLICATION**.

- ☐ Divisional.  
☐ Continuation.  
☐ Continuation-in-part (C-I-P).

## 2. Benefit of Prior U.S. Application(s) (35 U.S.C. §§ 119(e), 120, or 121)

**NOTE:** A nonprovisional application may claim an invention disclosed in one or more prior filed copending nonprovisional applications or copending international applications designating the United States of America. In order for a nonprovisional application to claim the benefit of a prior filed copending nonprovisional application or copending international application designating the United States of America, each prior application must name as an inventor at least one inventor named in the later filed nonprovisional application and disclose the named inventor's invention claimed in at least one claim of the later filed nonprovisional application in the manner provided by the first paragraph of 35 U.S.C. § 112. Each prior application must also be:

(i) An international application entitled to a filing date in accordance with PCT Article 11 and designating the United States of America; or

(ii) Complete as set forth in § 1.51(b); or

(iii) Entitled to a filing date as set forth in § 1.53(b) or § 1.53(d) and include the basic filing fee set forth in § 1.16; or

(iv) Entitled to a filing date as set forth in § 1.53(b) and have paid therein the processing and retention fee set forth in § 1.21(f) within the time period set forth in § 1.53(f).

37 C.F.R. § 1.78(a)(1).

**NOTE:** If the new application being transmitted is a divisional, continuation or a continuation-in-part of a parent case, or where the parent case is an International Application which designated the U.S., or benefit of a prior provisional application is claimed, then check the following item and complete and attach **ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED**.

**WARNING:** If an application claims the benefit of the filing date of an earlier filed application under 35 U.S.C. §§ 120, 121 or 365(c), the 20-year term of that application will be based upon the filing date of the earliest U.S. application that the application makes reference to under 35 U.S.C. §§ 120, 121 or 365(c). (35 U.S.C. § 154(a)(2) does not take into account, for the determination of the patent term, any application on which priority is claimed under 35 U.S.C. §§ 119, 365(a) or 365(b).) For a c-i-p application, applicant should review whether any claim in the patent that will issue is supported by an earlier application and, if not, the applicant should consider canceling the reference to the earlier filed application. The term of a patent is not based on a claim-by-claim approach. See Notice of April 14, 1995, 60 Fed. Reg. 20,195, at 20,205.

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**WARNING:** When the last day of pendency of a provisional application falls on a Saturday, Sunday, or Federal holiday within the District of Columbia, any nonprovisional application claiming benefit of the provisional application must be filed prior to the Saturday, Sunday, or Federal holiday within the District of Columbia. See 37 C.F.R. § 1.78(a)(3).

- ☐ The new application being transmitted claims the benefit of prior U.S. application(s). Enclosed are ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

### 3. Papers Enclosed

A. Required for filing date under 37 C.F.R. § 1.53(b) (Regular) or 37 C.F.R. § 1.153 (Design) Application

21 Pages of specification

2 Pages of claims

11 Sheets of drawing

**WARNING:** DO NOT submit original drawings. A high quality copy of the drawings should be supplied when filing a patent application. The drawings that are submitted to the Office must be on strong, white, smooth, and non-shiny paper and meet the standards according to § 1.84. If corrections to the drawings are necessary, they should be made to the original drawing and a high-quality copy of the corrected original drawing then submitted to the Office. Only one copy is required or desired. For comments on proposed then-new 37 C.F.R. § 1.84, see Notice of March 9, 1988 (1990 O.G. 57-62).

**NOTE:** "Identifying Indicia, if provided, should include the application number or the title of the invention, inventor's name, docket number (if any), and the name and telephone number of a person to call if the Office is unable to match the drawings to the proper application. This information should be placed on the back of each sheet of drawing a minimum distance of 1.5 cm. (5/8 inch) down from the top of the page . . ." 37 C.F.R. § 1.84(c)).

(complete the following, if applicable)

- ☐ The enclosed drawing(s) are photograph(s), and there is also attached a "PETITION TO ACCEPT PHOTOGRAPH(S) AS DRAWING(S)." 37 C.F.R. § 1.84(b).
- ☐ formal
- ☐ informal

### B. Other Papers Enclosed

7 Pages of declaration and power of attorney

1 Pages of abstract

       Other

### 4. Additional papers enclosed

- ☐ Amendment to claims
- ☐ Cancel in this applications claims \_\_\_\_\_ before calculating the filing fee. (At least one original independent claim must be retained for filing purposes.)
- ☐ Add the claims shown on the attached amendment. (Claims added have been numbered consecutively following the highest numbered original claims.)
- ☐ Preliminary Amendment
- ☐ Information Disclosure Statement (37 C.F.R. § 1.98)
- ☐ Form PTO-1449 (PTO/SB/08A and 08B)
- ☐ Citations

- ☐ Declaration of Biological Deposit
- ☐ Submission of "Sequence Listing," computer readable copy and/or amendment pertaining thereto for biotechnology invention containing nucleotide and/or amino acid sequence.
- ☐ Authorization of Attorney(s) to Accept and Follow Instructions from Representative
- ☐ Special Comments
- ☐ Other

**5. Declaration or oath (including power of attorney)**

**NOTE:** A newly executed declaration is not required in a continuation or divisional application provided that the prior nonprovisional application contained a declaration as required, the application being filed is by all or fewer than all the inventors named in the prior application, there is no new matter in the application being filed, and a copy of the executed declaration filed in the prior application (showing the signature or an indication thereon that it was signed) is submitted. The copy must be accompanied by a statement requesting deletion of the names of person(s) who are not inventors of the application being filed. If the declaration in the prior application was filed under § 1.47, then a copy of that declaration must be filed accompanied by a copy of the decision granting § 1.47 status or, if a nonsigning person under § 1.47 has subsequently joined in a prior application, then a copy of the subsequently executed declaration must be filed. See 37 C.F.R. §§ 1.63(d)(1)-(3).

**NOTE:** A declaration filed to complete an application must be executed, identify the specification to which it is directed, identify each inventor by full name including family name and at least one given name, without abbreviation together with any other given name or initial, and the residence, post office address and country or citizenship of each inventor, and state whether the inventor is a sole or joint inventor. 37 C.F.R. § 1.63(a)(1)-(4).

☒ Enclosed

Executed by

(check all applicable boxes)

- ☒ inventor(s).
- ☐ legal representative of inventor(s).  
37 C.F.R. §§ 1.42 or 1.43.
- ☐ joint inventor or person showing a proprietary interest on behalf of inventor who refused to sign or cannot be reached.
  - ☐ This is the petition required by 37 C.F.R. § 1.47 and the statement required by 37 C.F.R. § 1.47 is also attached. See item 13 below for fee.

☐ Not Enclosed.

**NOTE:** Where the filing is a completion in the U.S. of an International Application or where the completion of the U.S. application contains subject matter in addition to the International Application, the application may be treated as a continuation or continuation-in-part, as the case may be, utilizing ADDED PAGE FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION CLAIMED.

- ☐ Application is made by a person authorized under 37 C.F.R. § 1.41(c) on behalf of all the above named inventor(s).

(The declaration or oath, along with the surcharge required by 37 C.F.R. § 1.16(e) can be filed subsequently).

- ☐ Showing that the filing is authorized.  
(not required unless called into question. 37 C.F.R. § 1.41(d))

## 6. Inventorship Statement

**WARNING:** If the named inventors are each not the inventors of all the claims an explanation, including the ownership of the various claims at the time the last claimed invention was made, should be submitted.

The inventorship for all the claims in this application are:

☐ The same.

or

☐ Not the same. An explanation, including the ownership of the various claims at the time the last claimed invention was made,

☐ is submitted.

☐ will be submitted.

## 7. Language

**NOTE:** An application including a signed oath or declaration may be filed in a language other than English. An English translation of the non-English language application and the processing fee of \$130.00 required by 37 C.F.R. § 1.17(k) is required to be filed with the application, or within such time as may be set by the Office. 37 C.F.R. § 1.52(d).

☒ English

☐ Non-English

☐ The attached translation includes a statement that the translation is accurate. 37 C.F.R. § 1.52(d).

## 8. Assignment

☒ An assignment of the invention to Nokia Mobile Phones Ltd.

☒ is attached. A separate ☒ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM PTO 1595 is also attached.

☐ will follow.

**NOTE:** "If an assignment is submitted with a new application, send two separate letters—one for the application and one for the assignment." Notice of May 4, 1990 (1114 O.G. 77-78).

**WARNING:** A newly executed "CERTIFICATE UNDER 37 C.F.R. § 3.73(b)" must be filed when a continuation-in-part application is filed by an assignee. Notice of April 30, 1993, 1150 O.G. 62-64.

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**9. Certified Copy**

Certified copy(ies) of application(s)

Country	Appln. No.	Filed
Finland	982251	October 16, 1998
Country	Appln. No.	Filed
Country	Appln. No.	Filed

from which priority is claimed

☒ Is (are) attached.☐ will follow.

NOTE: The foreign application forming the basis for the claim for priority must be referred to in the oath or declaration. 37 C.F.R. § 1.55(a) and 1.63.

NOTE: This item is for any foreign priority for which the application being filed directly relates. If any parent U.S. application or International Application from which this application claims benefit under 35 U.S.C. § 120 is itself entitled to priority from a prior foreign application, then complete Item 18 on the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

**10. Fee Calculation (37 C.F.R. § 1.16)**A. ☒ Regular application

CLAIMS AS FILED					
Number filed			Number Extra	Rate	Basic Fee 37 C.F.R. § 1.16(a) \$760.00
Total					
Claims (37 C.F.R. § 1.16(c))	15	- 20 =	0	×	\$ 18.00
Independent					
Claims (37 C.F.R. § 1.16(b))	3	- 3 =	0	×	\$ 78.00
Multiple dependent claim(s), If any (37 C.F.R. § 1.16(d))				+	\$260.00

☐ Amendment cancelling extra claims is enclosed.☐ Amendment deleting multiple-dependencies is enclosed.☐ Fee for extra claims is not being paid at this time.

NOTE: If the fees for extra claims are not paid on filing they must be paid or the claims cancelled by amendment, prior to the expiration of the time period set for response by the Patent and Trademark Office in any notice of fee deficiency. 37 C.F.R. § 1.16(d).

Filing Fee Calculation \$ 760.00

B. ☐ Design application  
(\$310.00—37 C.F.R. § 1.16(f))

Filing Fee Calculation \$

C. ☐ Plant application  
(\$480.00—37 C.F.R. § 1.16(g))

Filing fee calculation \$

## 11. Small Entity Statement(s)

- ☐ Statement(s) that this is a filing by a small entity under 37 C.F.R. § 1.9 and 1.27 is (are) attached.

**WARNING:** "Status as a small entity must be specifically established in each application or patent in which the status is available and desired. Status as a small entity in one application or patent does not affect any other application or patent, including applications or patents which are directly or indirectly dependent upon the application or patent in which the status has been established. The refiling of an application under § 1.53 as a continuation, division, or continuation-in-part (including a continued prosecution application under § 1.53(d)), or the filing of a reissue application requires a new determination as to continued entitlement to small entity status for the continuing or reissue application. A nonprovisional application claiming benefit under 35 U.S.C. § 119(e), 120, 121, or 365(c) of a prior application, or a reissue application may rely on a statement filed in the prior application or in the patent if the nonprovisional application or the reissue application includes a reference to the statement in the prior application or in the patent or includes a copy of the statement in the prior application or in the patent and status as a small entity is still proper and desired. The payment of the small entity basic statutory filing fee will be treated as such a reference for purposes of this section." 37 C.F.R. § 1.28(a)(2).

**WARNING:** "Small entity status must not be established when the person or persons signing the . . . statement can unequivocally make the required self-certification." M.P.E.P., § 509.03, 6th ed., rev. 2, July 1996 (emphasis added).

(complete the following, if applicable)

- ☐ Status as a small entity was claimed in prior application  
\_\_\_\_\_ / \_\_\_\_\_, filed on \_\_\_\_\_, from which benefit  
is being claimed for this application under:

35 U.S.C. § ☐ 119(e),  
☐ 120,  
☐ 121,  
☐ 365(c),

and which status as a small entity is still proper and desired.

- ☐ A copy of the statement in the prior application is included.

Filing Fee Calculation (50% of A, B or C above)

\$ \_\_\_\_\_

**NOTE:** Any excess of the full fee paid will be refunded if small entity status is established and a refund request are filed within 2 months of the date of timely payment of a full fee. The two-month period is not extendable under § 1.136. 37 C.F.R. § 1.28(a).

## 12. Request for International-Type Search (37 C.F.R. § 1.104(d))

(complete, if applicable)

- ☐ Please prepare an international-type search report for this application at the time when national examination on the merits takes place.

**13. Fee Payment Being Made at This Time**

☐ Not Enclosed

☐ No filing fee is to be paid at this time.

*(This and the surcharge required by 37 C.F.R. § 1.16(e) can be paid subsequently.)*

☒ Enclosed

☒ Filing fee \$ 760.00

☒ Recording assignment  
(\$40.00; 37 C.F.R. § 1.21(h))  
(See attached "COVER SHEET FOR  
ASSIGNMENT ACCOMPANYING NEW  
APPLICATION".) \$ 40.00

☐ Petition fee for filing by other than all the  
inventors or person on behalf of the inventor  
where inventor refused to sign or cannot be  
reached  
(\$130.00; 37 C.F.R. §§ 1.47 and 1.17(i)) \$ \_\_\_\_\_

☐ For processing an application with a  
specification in  
a non-English language  
(\$130.00; 37 C.F.R. §§ 1.52(d) and 1.17(k)) \$ \_\_\_\_\_

☐ Processing and retention fee  
(\$130.00; 37 C.F.R. §§ 1.53(d) and 1.21(l)) \$ \_\_\_\_\_

☐ Fee for international-type search report  
(\$40.00; 37 C.F.R. § 1.21(e)) \$ \_\_\_\_\_

**NOTE:** 37 C.F.R. § 1.21(f) establishes a fee for processing and retaining any application that is abandoned for failing to complete the application pursuant to 37 C.F.R. § 1.53(f) and this, as well as the changes to 37 C.F.R. §§ 1.53 and 1.78(a)(1), indicate that in order to obtain the benefit of a prior U.S. application, either the basic filing fee must be paid, or the processing and retention fee of § 1.21(f) must be paid, within 1 year from notification under § 53(f).

Total fees enclosed \$ 800.00

**14. Method of Payment of Fees**

☒ Check in the amount of \$ 800.00

☐ Charge Account No. \_\_\_\_\_ in the amount of  
\$ \_\_\_\_\_

A duplicate of this transmittal is attached.

**NOTE:** Fees should be itemized in such a manner that it is clear for which purpose the fees are paid. 37 C.F.R. § 1.22(b).



## 15. Authorization to Charge Additional Fees

**WARNING:** If no fees are to be paid on filing, the following items should not be completed.

**WARNING:** Accurately count claims, especially multiple dependent claims, to avoid unexpected high charges, if extra claim charges are authorized.

- ☒ The Commissioner is hereby authorized to charge the following additional fees by this paper and during the entire pendency of this application to Account No. 16-1350:

☒ 37 C.F.R. § 1.16(a), (f) or (g) (filing fees)

☒ 37 C.F.R. § 1.16(b), (c) and (d) (presentation of extra claims)

**NOTE:** Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.16(d)), it might be best not to authorize the PTO to charge additional claim fees, except possibly when dealing with amendments after final action.

☒ 37 C.F.R. § 1.16(e) (surcharge for filing the basic filing fee and/or declaration on a date later than the filing date of the application)

☒ 37 C.F.R. § 1.17(a)(1)-(5) (extension fees pursuant to § 1.136(a)).

☐ 37 C.F.R. § 1.17 (application processing fees)

**NOTE:** ". . . A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).

☐ 37 C.F.R. § 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. § 1.311(b))

**NOTE:** Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).

**NOTE:** 37 C.F.R. § 1.28(b) requires "Notification of any change in status resulting in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying, . . . the issue fee. . . ." From the wording of 37 C.F.R. § 1.28(b), (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

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**16. Instructions as to Overpayment**

*NOTE: "... Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).*

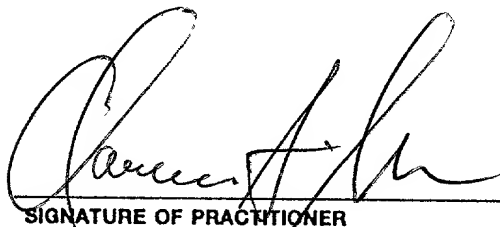
- ☒ Credit Account No. 16-1350  
☐ Refund

SEND ALL CORRESPONDENCE TO:

Reg. No. 24,622

Tel. No. (203) 259-1800

Customer No.

  
SIGNATURE OF PRACTITIONER  
Clarence A. Green

(type or print name of attorney)

PERMAN & GREEN, LLP

P.O. Address

425 Post Road, Fairfield, Connecticut 06430

☐ **Incorporation by reference of added pages**

*(check the following item if the application in this transmittal claims the benefit of prior U.S. application(s) (including an international application entering the U.S. stage as a continuation, divisional or C-I-P application) and complete and attach the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED)*

- ☐ Plus Added Pages for New Application Transmittal Where Benefit of Prior U.S. Application(s) Claimed

Number of pages added \_\_\_\_\_

- ☐ Plus Added Pages for Papers Referred to in Item 4 Above

Number of pages added \_\_\_\_\_

- ☐ Plus added pages deleting names of inventor(s) named in prior application(s) who is/are no longer inventor(s) of the subject matter claimed in this application.

Number of pages added \_\_\_\_\_

- ☐ Plus "Assignment Cover Letter Accompanying New Application"

Number of pages added \_\_\_\_\_

☒ **Statement Where No Further Pages Added**

*(if no further pages form a part of this Transmittal, then end this Transmittal with this page and check the following item)*

- ☒ This transmittal ends with this page.

## **METHOD OF CELL RE-SELECTION, AND NETWORK PART, AND SUBSCRIBER TERMINAL**

### **FIELD OF THE INVENTION**

5 The invention relates to implementing cell re-selection in a cellular network. The invention particularly relates to a cellular network using GPRS (General Packet Radio Service), and to a PBCCH (Packet Broadcast Control Channel) used therein, and to mapping system information onto the PBCCH.

### **BACKGROUND OF THE INVENTION**

10 When a subscriber terminal moves, measures must be taken which make sure that the subscriber terminal always listens to the base station that is best heard. The subscriber terminal receives system information sent by the base station on a control channel informing which neighbour base stations the subscriber terminal should also listen to. When the subscriber terminal detects  
15 that the received power of a neighbour cell signal it has listened to and possibly some other parameters are better than that of the cell, whose control channel the subscriber terminal has been listening to, then the subscriber terminal decides to perform cell re-selection. A network part of a cellular network, i.e. the network infrastructure including, for example, base stations, base station controllers and mobile services switching centres, can also discover the  
20 need for cell re-selection and inform the subscriber terminal about it. In connection with cell re-selection the subscriber terminal has to receive the system information of a new cell sent on its control channel.

In an ordinary GSM system the system information has a standard  
25 structure. In a cellular network using GPRS the structure and length of the system information sent by different cells may vary a lot. The subscriber terminal does not know in advance how long it takes to read the system information. In demanding packet transmission applications this may result in a situation, where a fairly long break may occur in performing packet transmission so  
30 that the user detects the break as a delay in the application operation. The user may interpret the delay as poor quality service.

### **BRIEF DESCRIPTION OF THE INVENTION**

35 It is thus an object of the invention to provide a method and an apparatus implementing the method so as to solve the above problems. This is

achieved with the method presented below. The method performs cell re-selection in a cellular network comprising a subscriber terminal measuring received powers of neighbour cells in accordance with system information received from a current cell; one of the neighbour cells as a new cell; the subscriber terminal receiving a part of the system information sent by the new cell. In this method the time used for receiving the system information of the new cell is calculated by employing the length information in the system information part sent by the new cell.

The invention also relates to a subscriber terminal comprising a radio connection to a current cell base station of a cellular network; means for measuring received powers of neighbour cells in accordance with system information received from a current cell; means for discovering the need for re-selection; means for receiving system information sent by a new cell. In addition, the subscriber terminal comprises means for calculating the time it takes to receive the system information of the new cell using the length information in a system information part sent by the new cell.

The invention also relates to a network part of a cellular network comprising means for sending system information of a cell. In addition the network part comprises means for placing length information indicating the system information length into a system information part.

The preferred embodiments of the invention are disclosed in the dependent claims.

The idea of the invention is that system information contains the system information length. On the basis of the length information the subscriber terminal can calculate how long it takes to receive the system information.

Several advantages are achieved with the method and system of the invention. The system information length information included in the system information enables an open way to map system information elements onto a logical control channel. The network operator can map only the necessary information elements onto the logical control channel, without limiting the total number of elements.

The subscriber terminal can estimate on the basis of the received system information length how long it takes to re-select a cell to said cell. Likewise the network part naturally knows how long it takes to re-select a cell to each cell.

Estimation of the cell re-selection time enables the functions of the network part and the subscriber terminal to be controlled before, during and after cell re-selection. For example, if the estimated time is exceeded by a certain percentage cell re-selection can be interrupted and re-started from the beginning, possibly with another cell. The user or the application employed by the user can also be provided with information about a starting cell re-selection, during which a break will occur in data transmission. The invention can also be utilized in battery or memory saving routines.

## 10 BRIEF DESCRIPTION OF THE DRAWINGS

In the following the invention will be described in greater detail in connection with the preferred embodiments and with reference to the accompanying drawings, in which

- 15 Figure 1A is a block diagram showing a cellular network,
- Figure 1B shows a circuit-switched connection,
- Figure 1C shows a packet-switched connection,
- Figure 2 shows the structure of a transceiver,
- Figure 3 illustrates the principle of cell re-selection,
- Figures 4A and 4B form a flow chart illustrating a cell re-selection method of the invention,
- 20 Figures 5A and 5B show examples of mapping system information into radio packets, and
- Figures 6A, 6B, 6C, 6D and 6E depict calculated cell re-selection times using different mapping parameters.

## 25 DETAILED DESCRIPTION OF THE INVENTION

- With reference to Figure 1 a typical cellular network structure of the invention and its interfaces to a fixed telephone network and a packet transmission network are described. Figure 1 comprises only the blocks that are essential for describing the invention, but for those skilled in the art it is obvious that a conventional cellular network also includes other functions and structures that will not be described here in greater detail. The invention is most preferably used in a GSM phase 2+ packet transmission, i.e. in GPRS (General Packet Radio Service). GPRS (General Packet Radio Service) is a new GSM-based service, where air interface capacity not used in circuit-switching is employed for packet transmission.

A cellular network typically comprises a fixed network infrastructure, or a network part, and subscriber terminals 150, which may be fixedly mounted, vehicle mounted or hand-held portable terminals. The network part comprises base stations 100. Several base stations 100 are, in turn, controlled  
 5 in a centralized manner by a base station controller 102 communicating with them. The base station 100 comprises transceivers 114, typically 1-16 transceivers 114. One transceiver 114 offers radio capacity to one TDMA frame, i.e. typically to eight time slots.

The base station 100 comprises a control unit 118 controlling the  
 10 operation of the transceivers 114 and a multiplexer 116. The multiplexer 116 arranges traffic and control channels used by multiple transceivers 114 to a single data link 160.

There is a connection from the transceivers 114 of the base station 100 to an antenna unit 112 implementing a bi-directional radio connection 170  
 15 to a subscriber terminal 150. The structure of the frames to be transmitted on the bi-directional radio connection 170 is also accurately determined and referred to as an air interface.

The subscriber terminal 150 can be, for example, a standard GSM mobile phone to which a laptop computer 152, which may be used in packet  
 20 transmission for ordering and processing packets, can for instance be connected by an additional card.

Figure 2 illustrates in greater detail the structure of a transceiver 114. A receiver 200 comprises a filter blocking frequencies outside a desired frequency band. A signal is then converted to an intermediate frequency or  
 25 directly to baseband, in which form the signal is sampled and quantized in an analogue-to-digital converter 202. An equalizer 204 compensates for interference caused by multipath propagation, for example. From the equalized signal a demodulator 206 takes a bit stream that is transmitted to a demultiplexer 208. The demultiplexer 208 separates the bit stream from different time slots  
 30 into its logical channels. A channel codec 216 decodes the bit stream of the different logical channels, i.e. decides whether the bit stream is signalling data transmitted to a control unit 214, or speech transmitted 240 to a speech codec 122 of the base station controller 102. The channel codec 216 also performs error correction. The control unit 214 performs internal control functions by  
 35 controlling various units. A burst former 228 adds a training sequence and a tail to the data arriving from the channel codec 216. A multiplexer 226 assigns

to each burst its time slot. A modulator 224 modulates digital signals to a radio frequency carrier. This function is of analogue nature and therefore a digital-to-analogue converter 222 is needed to perform it. A transmitter 220 comprises a filter limiting the bandwidth. In addition, the transmitter 220 controls the output power of the transmission. A synthesizer 212 arranges the necessary frequencies for different units. The synthesizer 212 includes a clock that may be controlled locally or in a centralized manner from somewhere else, for example, from the base station controller 102. The synthesizer 212 creates the necessary frequencies, for example, by a voltage-controlled oscillator.

Figure 2 shows how the transceiver structure can be further divided into radio frequency parts 230 and a digital signal processing processor including software 232. The radio frequency parts 230 comprise the receiver 200, the transmitter 220 and the synthesizer 212. The digital signal processing processor including software 232 comprises the equalizer 204, the demodulator 206, the demultiplexer 208, the channel codec 216, the control unit 214, the burst former 228, the multiplexer 226 and the modulator 224. The analogue-to-digital converter 202 is needed to convert the analogue radio signal into a digital signal, and correspondingly the digital-to-analogue converter 222 is needed to convert the digital signal into an analogue signal.

The base station controller 102 comprises a group switching field 120 and a control unit 124. The group switching field 120 is used for switching speech and data and for connecting signalling circuits. The base station 100 and the base station controller 102 form a base station system that comprises a transcoder 122. The transcoder 122 is generally located as close as possible to a mobile services switching centre 132, since speech can then be transferred in cellular network form between the transcoder 122 and the base station controller 102, thus saving transmission capacity.

The transcoder 122 converts different digital speech coding forms used between a public switched telephone network and a cellular network to suit one another, for example, from the 64 kbit/s fixed network form to another cellular network form (e.g. 13 kbit/s) and vice versa. The control unit 124 performs call control, mobility management, statistical data collection and signalling.

The structure of the subscriber terminal 150 can be described utilizing the description of the transceiver 114 structure in Figure 2. The structural parts of the subscriber terminal 150 are functionally the same as the ones in



the transceiver 114. In addition, the subscriber terminal 150 comprises a duplex filter between the antenna 112 and the receiver 200 and the transmitter 220, user interface parts and a speech codec. The speech codec is connected to the channel codec 216 through a bus 240.

5 As Figure 1A shows the group switching field 120 can perform switching (depicted by black spots) to a public switched telephone network (PSTN) 134 through the mobile services switching centre 132 and to a packet transmission network 142. A typical terminal 136 in the public switched telephone network 134 is an ordinary or an ISDN (Integrated Services Digital Network) phone.

10 The connection between the packet transmission network 142 and the group switching field 120 is established by a support node (SGSN = Serving GPRS Support Node) 140. The aim of the support node 140 is to transfer packets between the base station system and a gateway node (GGSN = Gateway GPRS Support Node) 144, and to keep record of the location of the subscriber terminal 150 within its area.

15 The gateway node 144 connects the packet transmission network 142 and a public packet transmission network 146. An Internet protocol or an X.25 protocol can be used at the interface. By encapsulating the gateway node 144 hides the internal structure of the packet transmission network 142 from the public packet transmission network 146, so for the public packet transmission network 146 the packet transmission network 142 resembles a sub-network, the public packet transmission network being able to address packets to the subscriber terminal 150 placed therein and to receive packets therefrom.

25 The packet transmission network 142 is typically a private network using an Internet protocol carrying signalling and tunnelled user data. The structure of the network 142 may vary operator-specifically regarding the architecture and protocols below the Internet protocol layer.

30 The public packet transmission network 146 may be, for example, a global Internet, to which a terminal 148, for example a server computer, with a connection thereto wants to transfer packets to the subscriber terminal 150.

35 At the air interface 170 time slots not allocated to circuit-switched transmission are typically used for packet transmission. Capacity is dynamically allocated for packet transmission, so when a data transmission request arrives any free channel can be allocated to be used in packet transmission.

The arrangement is flexible, circuit-switched connections taking priority over packet data links. When necessary, circuit-switched transmission cancels out packet-switched transmission, i.e. a time slot engaged in packet transmission is passed on to circuit-switched transmission. This is possible, since packet transmission endures such interruptions well; the transmission is proceeded in another time slot allocated for use. The arrangement can also be implemented in such a manner that no definite priority is given to circuit-switched transmission, but both circuit-switched and packet-switched transmission requests are served in their order of arrival.

Figure 1B describes how a circuit-switched data link is established between the subscriber terminal 150 and the terminal 136 of the public switched telephone network. A bold line shows how data is carried through the system at the air interface 170, from the antenna 112 to the transceiver 114, and from there multiplexed in the multiplexer 116 along the data link 160 to the group switching field 120, where a connection is established to the output heading to the transcoder 122, and from there onwards through the connection performed in the mobile services switching centre 132 to the terminal 136 connected to the public switched telephone network 134. In the base station 100, the control unit 118 controls the multiplexer 116 in the transmission, and in the base station controller 102 the control unit 124 controls the group switching field 120 to perform the correct connection.

Figure 1C shows a packet-switched data link. A laptop computer 152 is now connected to the subscriber terminal 150. A bold line describes how data to be transferred is carried from a server computer 148 to the laptop computer 152. Data can naturally also be transferred in the opposite direction, from the laptop computer 152 to the server computer 148. Data is carried through the system at the air interface 170, from the antenna 112 to the transceiver 114 and from there multiplexed in the multiplexer 116 along the data link 160 that is free of circuit-switched data transmission to the group switching field 120, where a connection is established to the output heading to the support node 140. From the support node 140 data is applied along the packet transmission network 142 through the gateway node 144 and is connected to the server computer 148 connected to the public packet transmission network 146.

In Figure 1B one time slot is used for circuit-switched transmission, but in Figure 1C the free capacity of the circuit-switched data link 160 corre-

sponding to all available time slots of the air interface 170 can be used. For the sake of clarity, a case where both circuit-switched and packet-switched data are simultaneously transferred is not described in Figures 1A and 1B. However, this is possible and very common, since the capacity free from circuit-switched data transmission can flexibly be used to implement packet-switched transmission or packet-switched signalling. Such a network can also be constructed, where circuit-switched data is not transferred at all, only packet data. Then the structure of the network can be simplified.

Figure 3 illustrates the principle of cell re-selection. The GSM cellular network spectrum is located between 890 - 960 MHz. The uplink direction employs the frequency range 890 - 915 MHz and the downlink direction the frequency range 935 - 960 MHz. In practice, it should be noted that a particular operator is able to use only a certain part of the total spectrum. The carrier spacing is 200 kHz. The duplex spacing of the uplink and downlink directions is 45 MHz. In a current cell 300A the subscriber terminal 150 listens to control channels at the frequency 947.2 MHz. The neighbour base stations 300B, 300C, 300D, 300E, 300F, 300G are indicated on the control channel, for example, in the GPRS on the PBCCH (Packet Broadcast Control Channel), as well as the frequencies of the downlink control channels of the neighbour base stations 935.2 MHz, 937.2 MHz, 939.2 MHz, 941.2 MHz, 943.2 MHz, 945.2 MHz, on which the subscriber terminal 150 has to measure the received power of the signal and possibly some other parameters.

On the radio connection 170A the subscriber terminal 150 listens to control channels of the current cell 300A. In addition, it regularly measures on unidirectional radio connections 170B, 170C, 170D, 170E, 170F, 170G the received powers of the neighbour cells 300B-300G.

In the GPRS the network part can order the subscriber terminal to perform MM (Mobility Management) measurements in ready state or in packet idle mode. In addition to the listening radio connections 170A-170G described in Figure 3, the subscriber terminal 150 may also have a bidirectional radio connection in progress with the current cell 300A. The subscriber terminal 150 is referred to as being in connected mode or in non-connected mode, depending on whether it has a bidirectional radio connection in progress or not. On the basis of the measurements the subscriber terminal 150 can make a decision about cell re-selection, or the network part can make the decision. Cell re-selection refers to a similar process as handover in a standard GSM

system.

In the example in Figure 3, when the subscriber terminal 150 moves from the current cell 300A to a new cell 300C, the received power of the control channels of the new cell 300C exceeds the received power of the control channels of the current cell 300A. The subscriber terminal 150 should in general communicate with the cell offering the best service. Cell re-selection is then performed, i.e. a new cell 300C becomes the current cell. In cell re-selection the subscriber terminal 150 has to listen to the system information of the new cell 300C from the control channels of the new cell 300C; the system information being referred to as packet system information in the GPRS.

If the subscriber terminal has no active connection, i.e. packet transmission is not in progress, it does not have to signal any information to the network part in connection with cell re-selection, if the routing area thereof remains unchanged. If the routing area changes, then the subscriber terminal has to signal a new cell to the network part. When the connection is active the subscriber terminal has to signal a cell update to the network part.

As noted above the structure and length of the system information sent by various cells in a cellular network using GPRS may vary considerably. Then, the subscriber terminal 150 does not know in advance how long it takes to read the system information. In demanding packet transmission applications this may result in a situation where a fairly long break may occur in packet transmission. The user may interpret the delay as poor quality of service.

The length of the system information sent on the PBCCH in the GPRS may vary from 3 to over 70 different system information elements. This causes uncertainty to the time it takes to re-select a cell, since it is not known in advance how much system information the subscriber terminal has to receive from the new cell 300C. The system information elements are:

- PSI1
- PSI2(0-7)
- PSI3
- PSI3bis(0-15)
- PSI4(0-7)
- PSI5(0-7)

There are six different elements. The numbers 0-7, 0-15 in brackets indicate the possible number of different instances of said elements.

Another factor affecting cell re-selection is how frequently an ele-

ment is mapped onto the PBCCH. If this frequency is low, the cell re-selection time increases.

A third affecting factor is the system information mapping scheme used. By selecting a fast mapping scheme the re-selection time decreases.

5 There are some factors that affect the mapping speed:

- The same system information element should not be mapped several times during a system information mapping period. One mapping period refers to the time during which one occurrence of each system information element has been received.

10 - The time between each system information element transmission should be kept at a minimum.

The network operator may use different measures to adjust the factors affecting the cell re-selection time, and thus control the re-selection time. These different factors can be selected so as to optimize the use of the cellular network.

15 Figures 4A and 4B describe the method of cell re-selection in a cellular network. The Figures form a flow chart when the bottom of Figure 4A and the top of Figure 4B are placed next to each other.

The method starts from block 400.

20 In block 402 the subscriber terminal measures received powers of neighbour cells in accordance with the system information received from the current cell.

In block 404 the subscriber terminal or the network part decides whether cell re-selection is needed based on the received powers measured by the subscriber terminal. If cell re-selection is not performed the subscriber terminal continues the measurements in block 402.

If cell re-selection is performed, then one of the neighbour cells is selected as the new cell in block 406. The cell offering the best received power is, for example, selected as the new cell.

30 Thereafter in block 408 the subscriber terminal receives a part of the system information sent by the new cell. The system information elements are sent on the PBCCH, and one of the elements, preferably an element referred to as PSI1 contains the system information length, i.e. a figure indicating the number of system information elements.

35 In block 410 the subscriber terminal decodes the received PSI1 element.

In block 412 the time it takes to receive the system information of the new cell is calculated using the length information in the system information part sent by the new cell. In order to perform the calculation, information is also needed on the organization of the system information, for example information on the multiframe length, the number of radio blocks used for transmitting system information in one multiframe and on the repeat period of the system information part. These parameters will be explained in more detail below.

Optionally it is decided in block 414 on the basis of the calculated time whether re-selection of said cell is continued. If re-selection is not desired, then the process proceeds to block 406 to select another neighbour cell as the new cell.

When it is desired to continue cell re-selection the process proceeds to an optional block 416 where the user is provided with information about cell re-selection. An example of the information provided is that packet transmission is interrupted for a calculated time. This has the advantage that the user believes that the service obtained is of higher quality. The application performing packet transmission can also be informed about cell re-selection.

Next in block 418 the following system information element is received, and in block 420 the received element is decoded.

In block 422 it is checked if all system information elements needed are received. If so, then cell re-selection is successfully performed, and the process can return to block 402, and start measuring received powers of neighbour cells in accordance with the system information received from the new cell.

If all elements are not yet received, then the time it has actually taken to receive the system information of the new cell can optionally be compared in block 424 with the time calculated in block 412. Re-selection of said new cell is interrupted if the actual time exceeds the calculated time. A safety margin, for example 20%, can also be determined to the calculated time, in which case the interruption is not performed until the actual calculated time is exceeded in reality by 20 per cent. When interruption occurs the process returns to block 406 where another neighbour cell is selected as the new cell. If no interruption occurs, then the process continues from block 418, where the following information element is received.

In the following an example will illustrate what the system information element referred to as PSI1 (Packet System Information Type One) may

be as described by CSN.1:

< PSI1 message content > ::=

```

    < PSI1 message type : bit (6) >
    { L | H < Global TFI > : Global TFI IE > }
5    < Common parameters : Common parameters struct >
    < PRACH Control Parameters : PRACH Control Parameters IE >
    < Control Channel Description : Control Channel Description struct >
    < Global Power Control Parameters : Global Power Control
    Parameters IE >
10   < spare padding > ;
    < Common parameters struct > ::=
        < BCCH_CHANGE_MARK : bit (3) >
        < PBCCH_CHANGE_MARK : bit (3) >
        < PSI_COUNT : bit (6) >
15   < BA_GIND : bit (1) >
        < NETWORK_CONTROL_ORDER1 : bit (1) >
        < BS_CV_MAX : bit (4) >
        < CONTROL_ACK_TYPE : bit (1) ;
        { 0 | 1 < PAN_DEC : bit (3) >
20   < PAN_INC : bit (3) >
        < PAN_MAX : bit (3) > } ;
    < Control Channel Description struct > ::=
        < BS_PBCCH_BLKs : bit (2) >
        { 0 | 1 < BS_PCC_CHANS : bit (4) > }
25   { 0 | 1 < BS_PAG_BLKs_RES : bit (4) > }
        { 0 | 1 < BS_PRACH_BLKs : bit (4) > }
        < DRX_TIMER_MAX : bit (3) >
        < EXT_DYN_ALLOCATION_SUPPORTED : bit (1) >
        < FIXED_ALLOCATION_SUPPORTED : bit (1) >
30   < CONTROL_CH_REL : bit (1) >

```

A six bit parameter referred to as PSI\_COUNT (Packet System Information Count) is a parameter according to the invention indicating how many different system information elements the subscriber terminal has to receive from said cell in order to obtain all the necessary system information.

35       Next another example of a possible PSI1 structure is described by CSN.1:

< PSI1 message content > ::=

- < **PAGE\_MODE** : bit (2) >
- < **PBCCH\_CHANGE\_MARK** : bit (3) >
- < **PSI\_CHANGE FIELD** : bit (4) >
- 5 < **PSI1\_REPEAT\_PERIOD** : bit (4) >
- < **PSI\_COUNT\_LR** : bit (6) >
- { 0 | 1 < **PSI\_COUNT\_HR** : bit (4) > }
- < **MEASUREMENT\_ORDER** : bit (1) >
- < **GPRS Cell Options** : GPRS Cell Options IE >
- 10 < **PRACH Control Parameters** : PRACH Control Parameters IE >
- < **PCCCH Organization Parameters** : PCCCH Organization  
Parameters IE >
- < **Global Power Control Parameters** : Global Power Control  
Parameters IE >
- 15 < **PSI\_STATUS\_IND** : bit >
- < padding bits >
- ! < Distribution part error : bit (\*) = < no string > >;

In this example the parameter **PSI\_COUNT** consists of two parameters, a **PSI\_COUNT\_LR** (LR = Low Rate) and an optional **PSI\_COUNT\_HR** (HR = High Rate). These two parameters are added together in order to obtain the **PSI\_COUNT**.

Figure 5A depicts two different mapping schemes. Different parameters are selected for each scheme so that the parameter effect can be illustrated at the cell re-selection time.

25 In the description below a 51-multiframe is used as an example, but the principles hold true also for other types of multiframes, for example for a 52-multiframe. The 51-multiframe is shown in the horizontal direction, frame number zero of the 51-multiframe is shown on the left, and frame number fifty of the 51-multiframe on the right. X illustrates frames in which information elements cannot be placed, since they are allocated for other purposes, like transferring timing information or frequency correction information. X indicates one frame, and XX two frames. Radio blocks B0, B1, B2, B3, B4, B5, B6, B7, B8 and B9 are each four TDMA frames in length owing to interleaving that is performed among four TDMA frames. Information elements can be placed in  
30 radio blocks B0-B9.  
35

M refers to the value that is used for calculating TC. TC is used for



locating a PSI1 message. In the Figure TC is described vertically as an increasing figure. A first 51-multiframe is at first sent using TC value zero, then a second 51-multiframe is sent using TC value one etc. M can also be referred to as a repeat period value, since it describes at what 51-multiframe intervals the PSI1 message repeats itself. The calculation formula is:

$$TC = (FN \text{ DIV } MFL) \text{ mod } M, \quad (1)$$

where DIV is integer number division,

mod is modulo,

FN is multiframe number (0-2715647)

10 MFL is multiframe length (51 or 52),

M varies between 1-16, assuming that it cannot be 1, if BS is 1 or 2.

In Figure 5A BS refers to a number by which the network part informs the subscriber terminal into how many radio blocks system information is mapped in one 51-multiframe.

15 In the example above the service provider has selected value four as mapping parameter M and value one as mapping parameter BS. PSI\_COUNT obtains the value six. Slightly more than six 51-multiframes are used for receiving the described information elements PSI1, PSI2(0), PSI2(1), PSI2(3), PSI1 repeat, PSI3 and PSI4. The cell selection time can be calculated as 1441.4 milliseconds.

20 In the example below the service provider has selected value five as mapping parameter M and value four as mapping parameter BS. PSI\_COUNT obtains the value twenty-one. The PSI1 message is thus not repeated as frequently as in the above example. A fourfold amount of the transfer capacity of one 51-multiframe is used compared with the example above. Therefore slightly less than six 51-multiframes are used for receiving the described information elements PSI1, PSI2(0), PSI2(1), PSI1 repeat, PSI2(2), PSI2(3), PSI2(4), PSI2(5), PSI2(6), PSI2(7), PSI3, PSI3B(0), PSI3B(1), PSI3B(2), PSI3B(3), PSI3B(4), PSI3B(5), PSI3B(6), PSI3B(7),  
30 PSI4(0), PSI4(1), PSI4(2), PSI1 repeat, PSI4(3), PSI4(4), and PSI1 repeat. The cell selection time can be calculated as 1316.7 milliseconds. The letter B in the information elements refers to bis.

35 Even though the subscriber terminal has to receive much more system information in the example below than in the example above, the re-selection time is shorter in the example below. This is caused by the selected mapping parameter values.

In the following an example is presented of the rules the subscriber terminal should use in order to know how the network part sends the packet system information. The messages are sent in determined multiframe radio blocks. The message occurrences are determined using the previously presented formula 1. The basic rules are:

1. PSI1 is sent in B0 using TC value zero.

2. If  $BS > 1$ , then PSI1 appears only twice in the multiframe using TC value 0. The second PSI1 occurrence using TC value 0 is in the last available radio block of the multiframe.

In addition to the basic rules various rules can be determined on how the rest of the packet system information is mapped, for example:

3. The rest of the packet system information is mapped to the available radio blocks using the rule: All existing instances of PSIx and PSIxbs (where  $x=2,3,4,5$ ) are placed into the radio blocks which are to be used in ascending order.

4. The rest of the unfilled available radio blocks are filled in accordance with rule 3 starting from PSI1.

Figure 5B shows an example of how values M eight, BS four, and PSI\_COUNT twenty-eight can be used to place the system information elements into a 51-multiframe using the four rules above. The available radio blocks are B0, B2, B5 and B7. According to rule 1, PSI1 is placed in B0 using TC value zero. According to rule 2, PSI1 repeat is placed into the last available radio block, or B7, using TC value zero. The rest of the information elements are placed in accordance with rule 3 in ascending order starting from TC value zero from B2 and ending at TC value 7 in B0. In accordance with rule 4 system information elements starting from PSI1, i.e. elements PSI1, PSI2(0) and PSI2(1) are placed in ascending order into the rest of the radio blocks, or B2, B5 and B7.

An example is shown below of an algorithm by which the network part or the subscriber terminal can calculate the cell re-selection time in ideal circumstances. Ideal means that all system information elements are correctly received the first time, and that no mistakes occur during reception. The algorithm is written with a notation understood by Matlab™ program.

Input parameter from the network system information elements used for calculating the ideal cell reselection time:  
MFL = MultiFrame Length

BS = BS\_PBCCH\_BLKs;  
 N = PSI\_COUNT  
 M = PSI1\_REPEAT\_PERIOD

5

Assumption:

PSI1\_REPEAT\_PERIOD cannot equal 1 if BS\_PBCCH\_BLKs  
 equal 1 or 2.

10

1. if( BS == 1 | BS == 2 )  
 2.   I = BS\*(M - 1);  
 3. end

15

4. if( BS == 3 )  
 5.   I = BS\*(M - 1) + 1;  
 6. end  
 7. if( BS == 4 )  
 8.   I = BS\*(M - 1) + 2;  
 9. end

20

10. if( BS > 1 )  
 11.   N1 = N + 1;  
 12. else  
 13.   N1 = N;  
 14. end

25

15. M1 = 0;  
 16. Q = 1;  
 17. s=0;  
 18. while( Q == 1 )

30

19.   if( N1 > BS )  
 20.       M1 = M1 + 1;  
 21.       N1 = N1 - BS;  
 22.       if( BS == 3 | BS == 4 )  
 23.           if( rem(M1,M) == 0 )  
 24.               N1 = N1 + 2;  
 25.               s = s + 1;

35

26.       end  
 27.   end

```

28. else
29.     Q = 0;
30.     if( M1 == 0 & BS > 1 )
31.         N1 = N1 - 1;
5   32.     end
33. end
34. end

35. if( s > 0 )
10  36.     if( BS == 3 | BS == 4 )
37.         if( rem(M1,M) == 0 )
38.             N1 = N1 - 1;
39.         end
40.     end
15  41.     M1 = M1 - s;
42. end

43. if( N > ( I + 1 ) )
44.     if( BS > 1 )
20  45.         R = N - ( M*BS );
46.     else
47.         R = N - M - 1;
48.         if( R < 0 )
49.             R = 0;
25  50.         end
51.     end
52.     m = fix(R / I) + 1;
53.     M1 = M1 + m;
30  54. end

55. if( N1 == 1 )
56.     if( MFL == 51 )
57.         x = 6;
58.     else
35  59.         x = 4;
60.     end

```

61. end

62. if( BS == 2 )

63.   if( N1 == 2 )

5       64.     x = 30;

65.   end

66. end

67. if( BS == 3 | BS == 4 )

10       68.   if( N1 == 2 )

69.       if( MFL == 51 )

70.           x = 16;

71.       else

72.           x = 17;

15       73.   end

74.   else

75.       if( N1 == 3 )

76.           x = 30;

77.       end

20       78.   end

79. end

80. if( N1 == 4 )

81.   if( MFL == 51 )

25       82.     x = 40;

83.   else

84.       x = 43;

85.   end

86. end

30       87. T1 = MFL\_TIME \* M1;

88. T2 = TDMA\_TIME \* x;

89. T = T1 + T2;

Fixed parameter:

35       TDMA\_TIME = 1 burst time;

Variable:

$MFL\_TIME = MFL * TDMA\_TIME;$

Variable explanation:

5 M : Parameter available from the network system information.  
Used to calculate the TC-value.

Note: This value is the same as the  
mentioned PSI1\_REPEAT\_PERIOD.

10 PSI\_COUNT : Parameter available from the network  
system information.

And:

$rem(x,y)$

equals modulus division (MOD), and:

$fix(x,y)$

15 equals integer division (DIV), and

T

equals the actual ideal cell re-selection time.

20 Figures 6A, 6B, 6C, 6D, 6E illustrate the cell re-selection times using different mapping parameters calculated by the above algorithm. The PSI\_COUNT value is described on the X-axis and the cell re-selection time in milliseconds on the y-axis. In all Figures the PSI\_COUNT obtains values between 1-28 and MFL is 51.

25 In Figure 6A M is 4. Basically, four values are calculated for each PSI\_COUNT value, the BS obtaining the values 1, 2, 3 and 4. The dots form four curves, the lowest one corresponding to BS value 4, the second lowest to BS value 3, the third lowest to BS value 2 and the highest to BS value 1. The more frequently information elements are sent, the faster the cell re-selection can be performed.

30 Figures 6B, 6C, 6D and 6E describe the effect of changing the M value. The lower curve of dots corresponds to M value 16 and the higher curve to M value 4. In Figure 6B, BS obtains the value 1, in Figure 6C the value 2, in Figure 6D the value 3 and Figure 6E the value 4. The more radio blocks each multiframe uses, the less the M value affects the cell re-selection time.

The example above was based on the presented basic rules. It is obvious that one skilled in the art may apply other rules too, in order to implement the invention. In the following an example of different rules is presented:

1. PSI shall be sent in block B0 when TC=0.
- 5        2. If the value of the parameter BS\_PBCCH\_BLKs is greater than 1, the PSI1 shall also be sent in block B6 (for 52-multiframe) or B5 (for 51-multiframe) when TC=0.
3. The PSI messages in the group sent with a high repetition rate shall be sent in a sequence determined by the network and starting at TC=0, using the PBCCH blocks within each multiframe which are not occupied according to rule 1 or 2. The sequence of these PSI messages shall be repeated starting at each occurrence of TC=0.
- 10       4. The PSI messages in the group sent with a low repetition rate shall be sent in a sequence determined by the network and continuously repeated, using the PBCCH blocks within each multiframe which are not occupied according to rules 1 to 3.

If there are multiple instances of a particular PSI message type, they shall all be sent within the same PSI message group according to either rule 3 or 4 above. They shall be sent in a single sequence in the ascending order of the message instance number of that PSI message type.

The same PSI message shall not occur twice within the lists defined by the PSI\_COUNT\_LR and PSI\_COUNT\_HR.

A full set of Packet System Information messages contains one consistent set of the messages included in PSI\_COUNT\_LR and one consistent set of messages included in PSI\_COUNT\_HR plus the PSI1 message.

The invention is preferably implemented by software. The invention then requires relatively simple software changes within a strictly restricted area in the network part and the subscriber terminal. The subscriber terminal comprises means for measuring received powers of neighbour cells in accordance with the system information received from the current cell, means for discovering the need for cell re-selection, means for receiving system information sent by the new cell, and means for calculating the time it takes to receive the system information of the new cell based on the length information in the system information part sent by the new cell. The network part comprises means for sending cell system information, and means for placing the length information indicating the system information length into a part of the system informa-

tion. The matter disclosed in the dependent method claims can correspondingly be implemented by the means performing the operation. The means are preferably implemented as software, for example, as a software to be carried out in a processor or as an ASIC (Application Specific Integrated Circuit). In the subscriber terminal the means are implemented by a processor including software 232, for example. In the network part the means can be divided differently depending on the responsibilities between the control unit 118 of the base station 100, the control unit of the base station controller 102 and possibly also the support node 140.

Even though the invention has been described above with reference to the example of the accompanying drawings, it is obvious that the invention is not restricted thereto but can be modified in various ways within the scope of the inventive idea disclosed in the attached claims.



We claim:

1. A method for performing cell re-selection in a cellular network, comprising :
  - a subscriber terminal measuring received powers of neighbour cells
  - 5 in accordance with system information received from a current cell;
  - selecting one of the neighbour cells as a new cell;
  - the subscriber terminal receiving a part of the system information sent by the new cell;
  - calculating the time used for receiving the system information of the
  - 10 new cell by employing the length information in the system information part sent by the new cell.
2. A method as claimed in claim 1, wherein calculating the time comprises:
  - using information on multiframe length.
- 15 3. A method as claimed in claim 1, wherein calculating the time comprises:
  - using information on the number of radio blocks used for sending system information in one multiframe.
- 20 4. A method as claimed in claim 1, wherein calculating the time comprises:
  - using information on a repeat period of the system information part.
5. A method as claimed in claim 1, further comprising:
  - deciding on the basis of the calculated time whether to continue the
  - re-selection of said new cell.
- 25 6. A method as claimed in claim 1, further comprising:
  - providing the user with information associated with cell re-selection.
7. A method as claimed in claim 1, further comprising:
  - comparing the time spent in reality for receiving the system infor-
  - mation of the new cell with the calculated time.
- 30 8. A method as claimed in claim 7, further comprising:
  - interrupting the re-selection of said new cell, if the time spent in re-
  - ality exceeds the calculated time.
9. A method as claimed in claim 8, further comprising:
  - selecting another neighbour cell as the new cell.
- 35 10. A method as claimed in claim 1 wherein the cellular network using GPRS and the method further comprises:

placing the system information on a PBCCH.

11. A method as claimed in claim 10, wherein the system information is formed of system information elements comprising an element referred to as PSI1 containing the system information length as a figure indicating the number of system information elements.

12. A method as claimed in claim 10, wherein the PBCCH is placed in at least one four TDMA frames long radio block in each multiframe.

13. A subscriber terminal comprising:  
a radio connection to a current cell base station of a cellular network;

means for measuring received powers of neighbour cells in accordance with system information received from a current cell;

means for discovering the need for cell re-selection;

15 means for receiving system information sent by a new cell;

means for calculating the time it takes to receive the system information of the new cell using the length information in a system information part sent by the new cell.

14. A network part of a cellular network comprising

means for sending system information of a cell;

20 means for placing information indicating the system information length into a part of the system information.

15. A network part as claimed in claim 14, further comprising:

means for calculating the time it takes for a subscriber terminal to receive system information using the length information.

## ABSTRACT

The invention relates to a method for performing cell re-selection in a cellular network, and a subscriber terminal and a network part using the method. In the method: (402) the subscriber terminal measures received powers of  
 5 neighbour cells in accordance with system information received from a current cell; (406) one of the neighbour cells is selected as a new cell; (408) the subscriber terminal receives a part of the system information sent by the new cell; (408, 412) the time it takes to receive the system information of the new cell is calculated using length information in a system information part sent by the  
 10 new cell.  
 (Figures 4A and 4B)

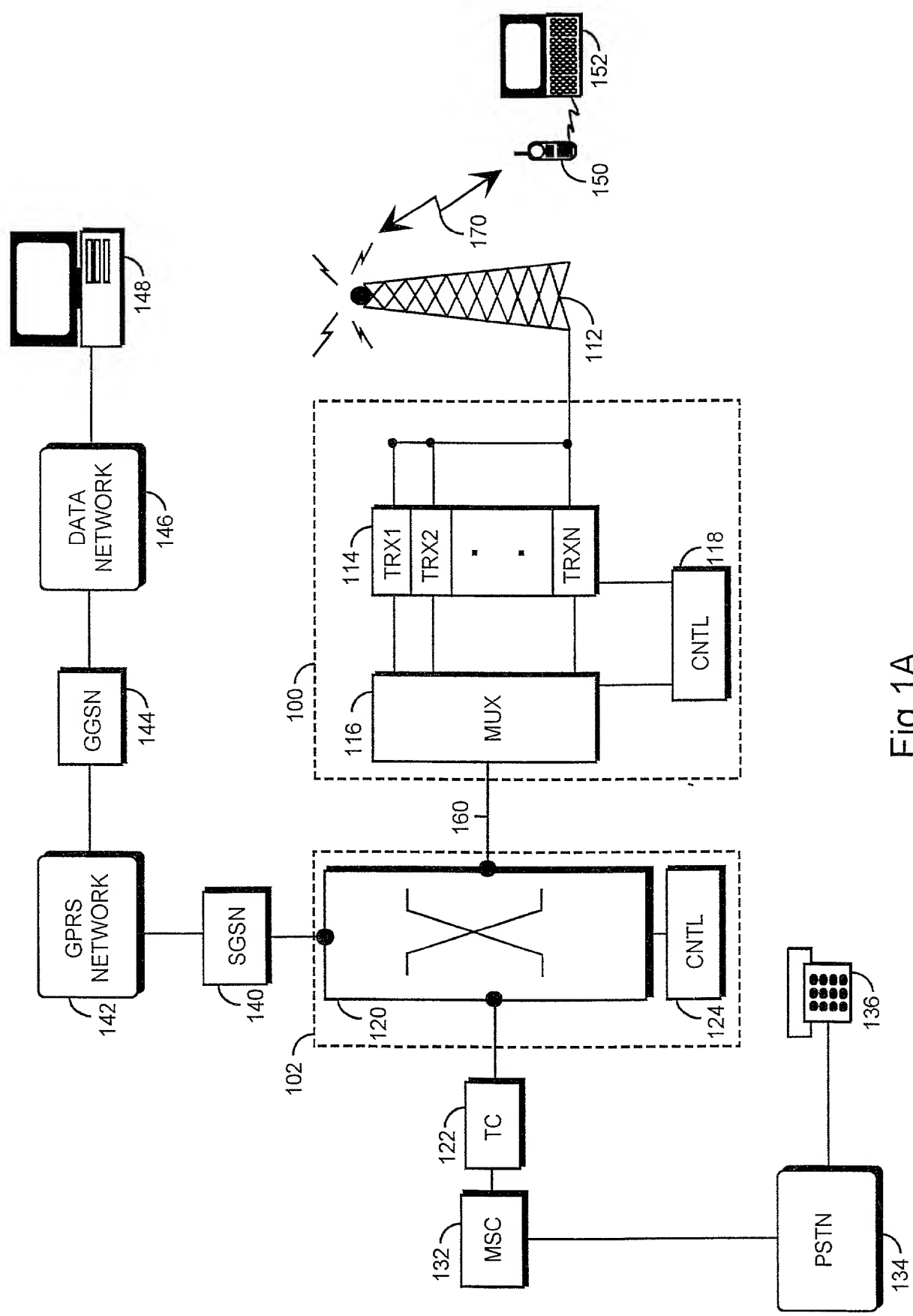


Fig 1A

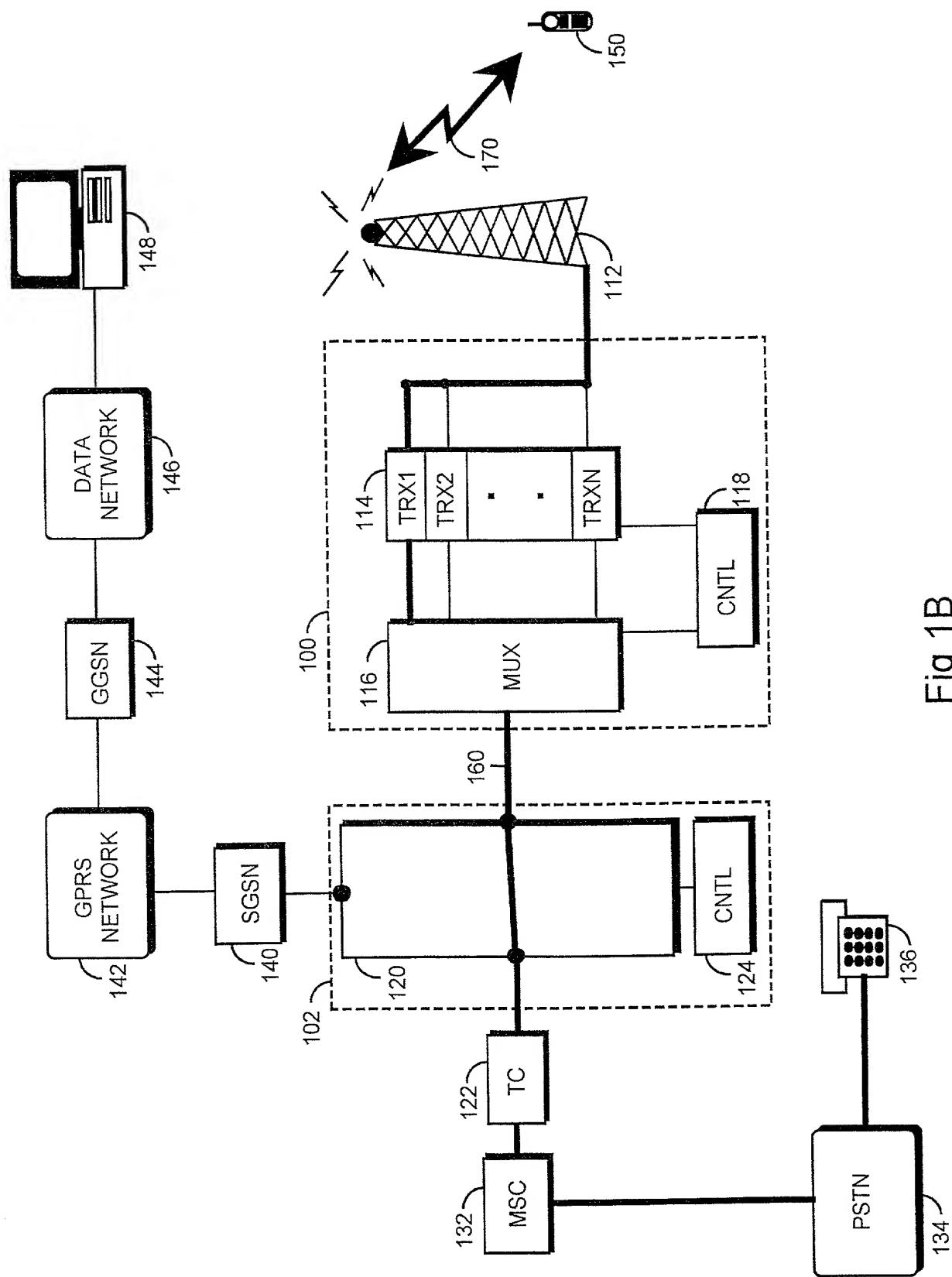


Fig 1B

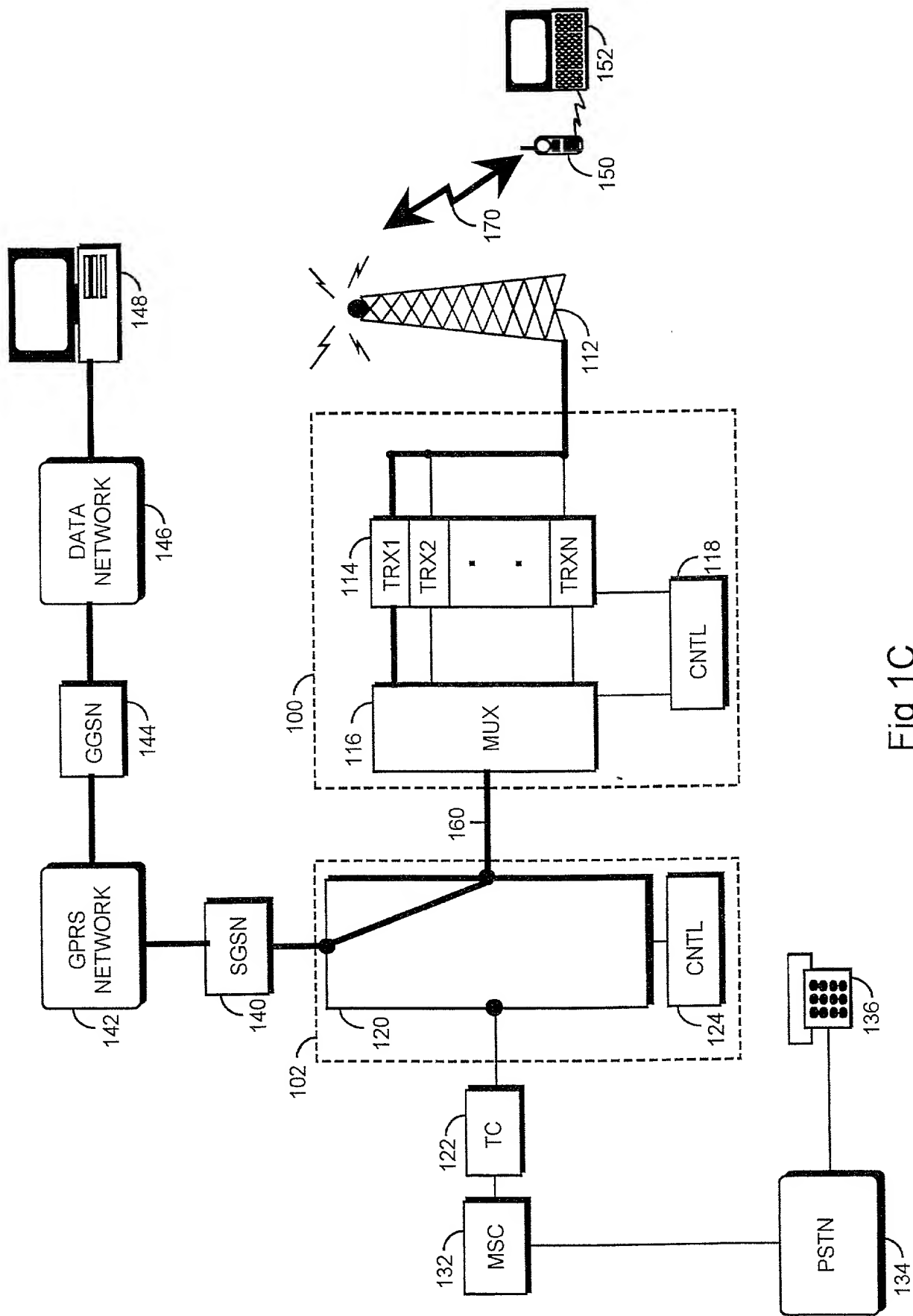


Fig 1C

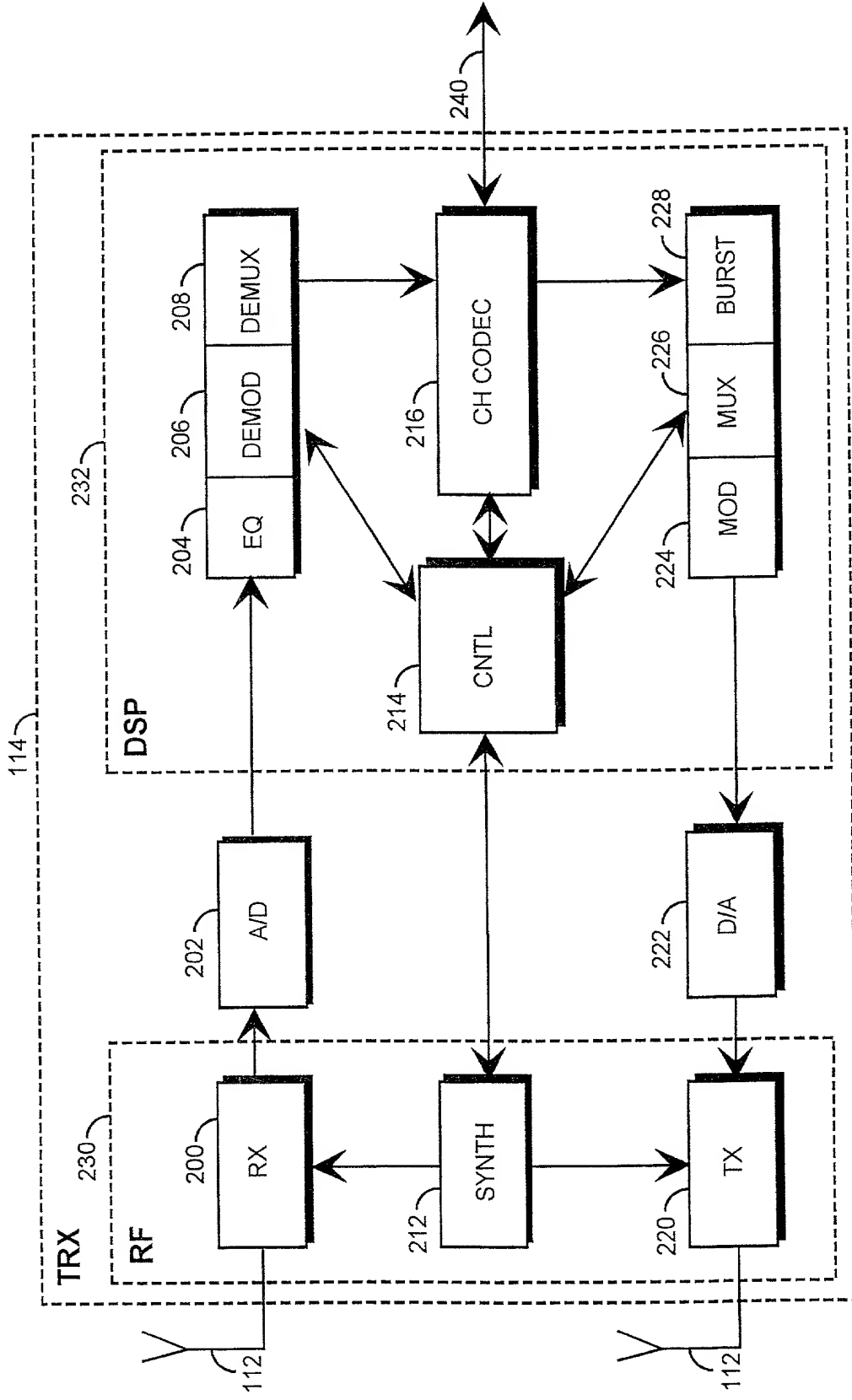


Fig 2

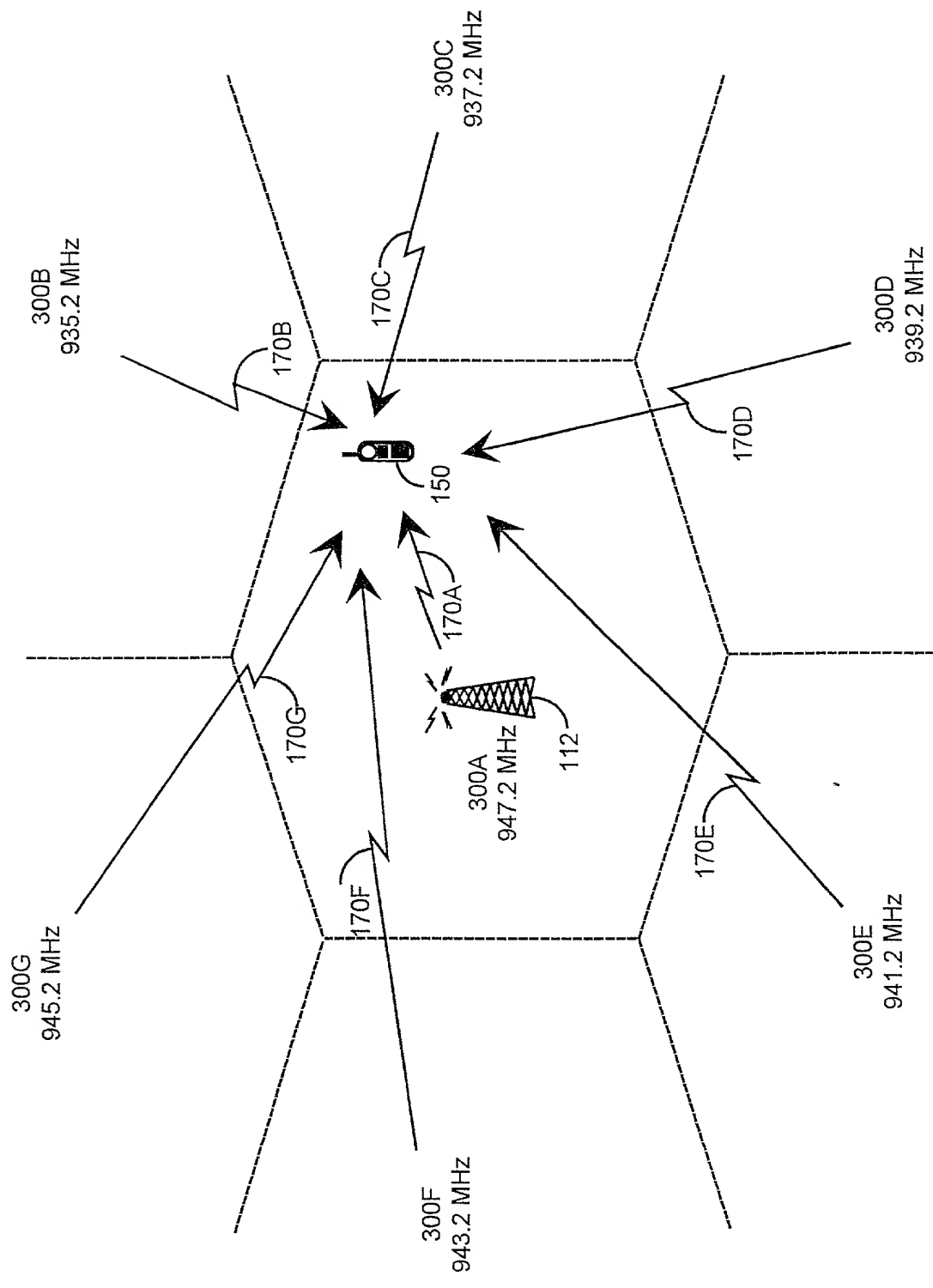


Fig 3



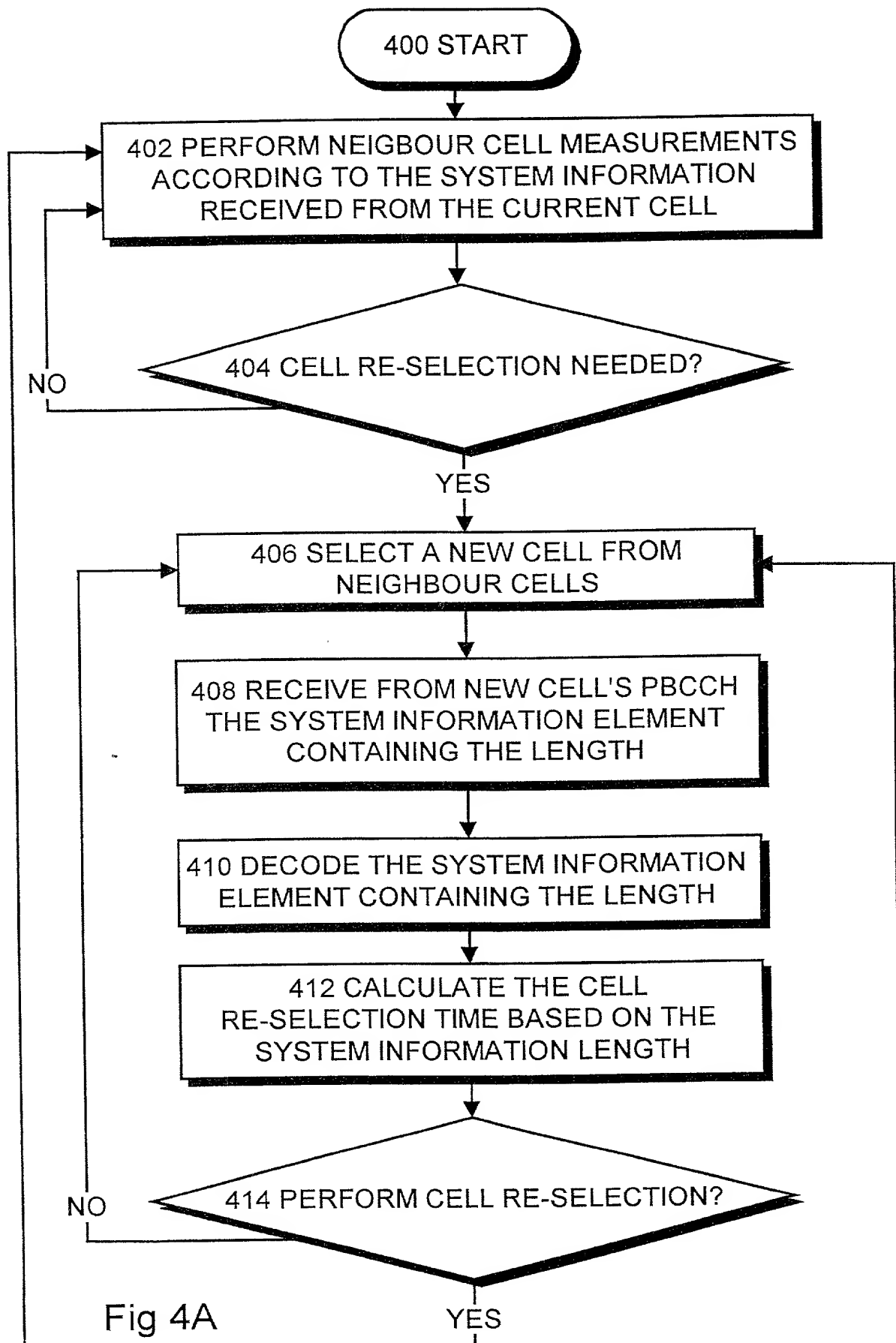


Fig 4A

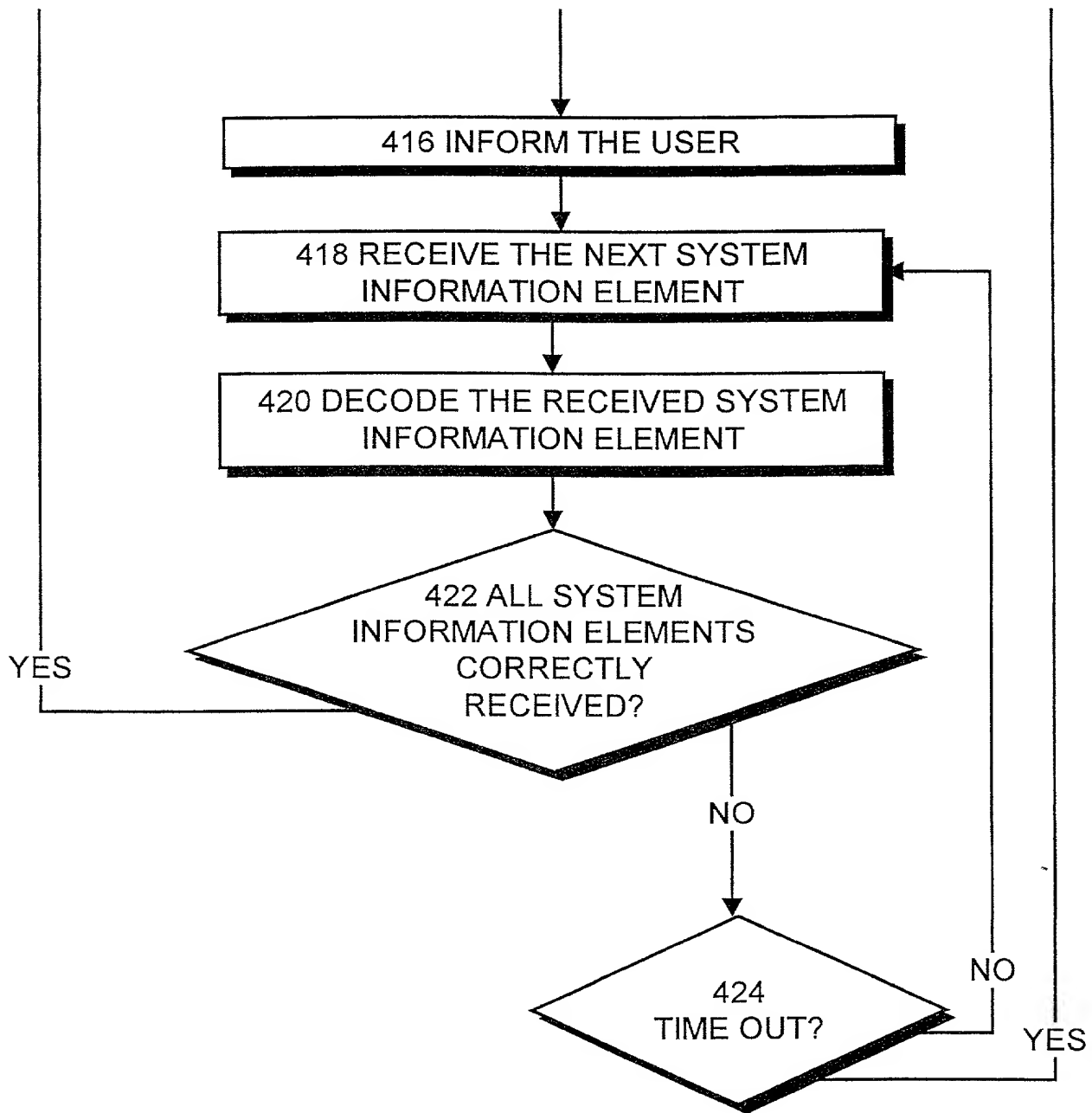


Fig 4B

TC		TDMA-MULTIFRAME #0										TDMA-MULTIFRAME #50									
		XX	B0	B1	XX	B2	B3	XX	B4	B5	XX	B6	B7	XX	B8	B9	X				
M=4 BS=1	0		PSI1																		
	1		PSI2(0)																		
	2		PSI2(1)																		
	3		PSI2(3)																		
	0		PSI1																		
	1		PSI3																		
	2		PSI4																		
M=5 BS=4	0		PSI1			PSI2(0)				PSI2(1)			PSI1								
	1		PSI2(2)		PSI2(3)	PSI2(4)				PSI2(5)			PSI2(6)								
	2		PSI2(6)		PSI3B(0)	PSI3B(1)				PSI3B(2)			PSI3B(3)								
	3		PSI3B(3)		PSI3B(4)	PSI3B(5)				PSI3B(6)			PSI3B(7)								
	4		PSI3B(7)		PSI4(0)	PSI4(1)				PSI4(2)			PSI4(3)								
			PSI1		PSI4(3)					PSI4(4)			PSI1								
	0																				

Fig 5A

TDMA-MULTIFRAME #0										TDMA-MULTIFRAME #50									
TC	XX	B0	B1	XX	B2	B3	XX	B4	B5	XX	B6	B7	XX	B8	B9	X			
M=8 BS=4 0		PSI1			PSI2(0)				PSI2(1)			PSI1							
1		PSI2(2)			PSI2(3)				PSI2(4)			PSI2(5)							
2		PSI2(6)			PSI2(7)				PSI3			PSI3B(0)							
3		PSI3B(1)			PSI3B(2)				PSI3B(3)			PSI3B(4)							
4		PSI3B(5)			PSI3B(6)				PSI3B(7)			PSI4(0)							
5		PSI4(1)			PSI4(2)				PSI4(3)			PSI4(4)							
6		PSI4(5)			PSI4(6)				PSI4(7)			PSI5							
7		PSI5B			PSI1				PSI2(0)			PSI2(1)							

Fig 5B

ms PSI's

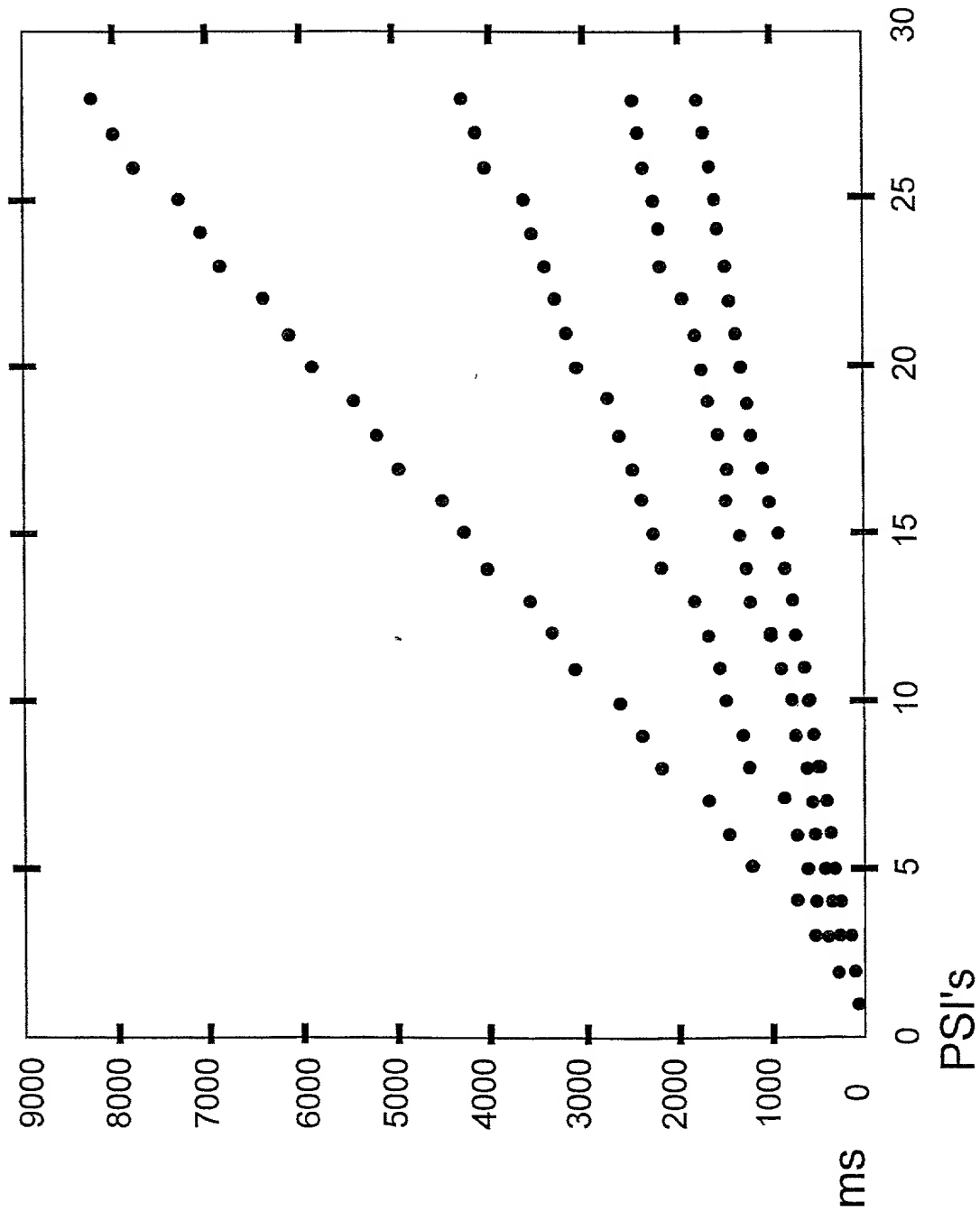


Fig 6A

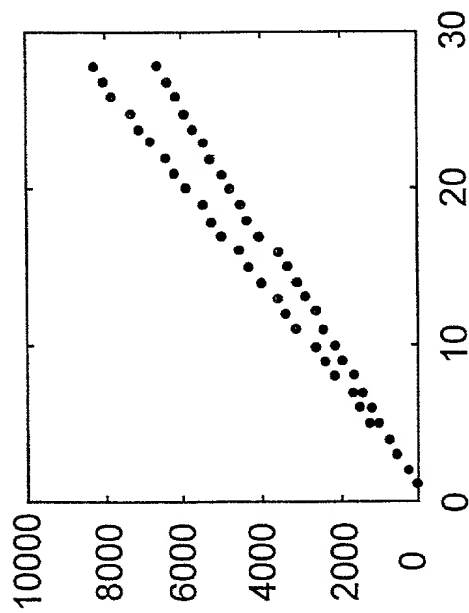


Fig 6B

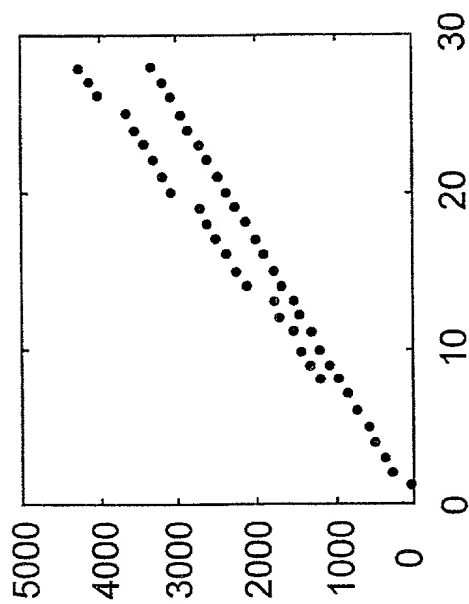


Fig 6C

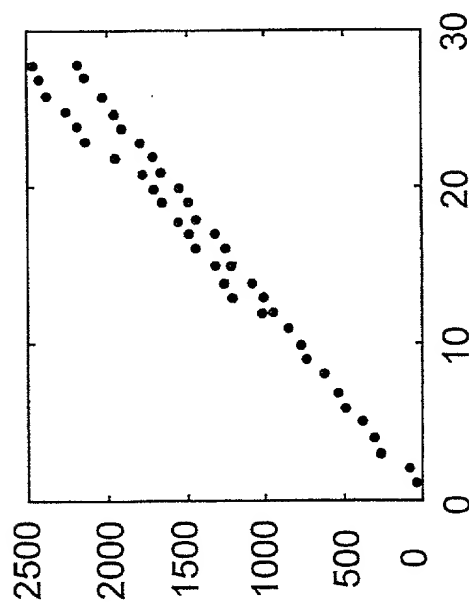


Fig 6D

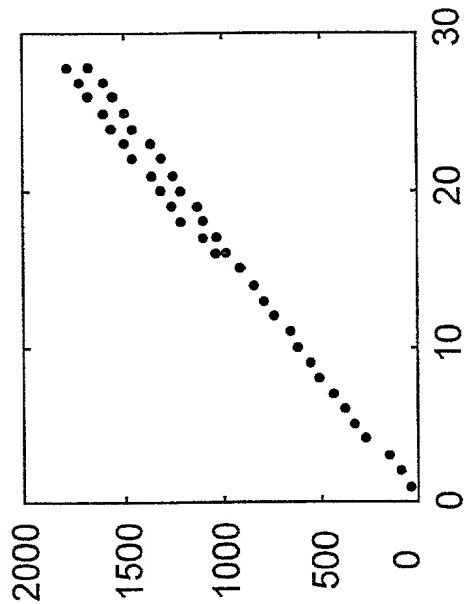


Fig 6E

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**COMBINED DECLARATION AND POWER OF ATTORNEY**(ORIGINAL, DESIGN, NATIONAL STAGE OF PCT, SUPPLEMENTAL, DIVISIONAL,  
CONTINUATION, OR C-I-P)

---

As a below named inventor, I hereby declare that:

**TYPE OF DECLARATION**

This declaration is of the following type:

*(check one applicable item below)*

- ☒ original.  
☐ design.  
☐ supplemental.

NOTE: If the declaration is for an International Application being filed as a divisional, continuation or continuation-in-part application, do not check next item; check appropriate one of last three items. -

- ☐ national stage of PCT.

NOTE: If one of the following 3 items apply, then complete and also attach ADDED PAGES FOR DIVISIONAL, CONTINUATION OR C-I-P.

NOTE: See 37 C.F.R. § 1.63(d) (continued prosecution application) for use of a prior nonprovisional application declaration in the continuation or divisional application being filed on behalf of the same or fewer of the inventors named in the prior application.

- ☐ divisional.  
☐ continuation.

NOTE: Where an application discloses and claims subject matter not disclosed in the prior application, or a continuation or divisional application names an inventor not named in the prior application, a continuation-in-part application must be filed under 37 C.F.R. § 1.53(b) (application filing requirements — nonprovisional application).

- ☐ continuation-in-part (C-I-P).

**INVENTORSHIP IDENTIFICATION**

**WARNING:** If the inventors are each not the inventors of all the claims, an explanation of the facts, including the ownership of all the claims at the time the last claimed invention was made, should be submitted.

My residence, post office address and citizenship are as stated below, next to my name. I believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter that is claimed, and for which a patent is sought on the invention entitled:

**TITLE OF INVENTION**

Method of cell re-selection, and network part, and subscriber terminal

## SPECIFICATION IDENTIFICATION

the specification of which:

(complete (a), (b), or (c))

(a) ☒ is attached hereto.

NOTE: "The following combinations of information supplied in an oath or declaration filed on the application filing date with a specification are acceptable as minimums for identifying a specification and compliance with any one of the items below will be accepted as complying with the identification requirement of 37 CFR 1.63:

"(1) name of inventor(s), and reference to an attached specification which is both attached to the oath or declaration at the time of execution and submitted with the oath or declaration on filing;

"(2) name of inventor(s), and attorney docket number which was on the specification as filed; or

"(3) name of inventor(s), and title which was on the specification as filed."

Notice of July 13, 1995 (1177 O.G. 60).

(b) ☐ was filed on \_\_\_\_\_, as ☐ Serial No. 0 / \_\_\_\_\_  
or ☐ \_\_\_\_\_  
and was amended on \_\_\_\_\_ (if applicable).

NOTE: Amendments filed after the original papers are deposited with the PTO that contain new matter are not accorded a filing date by being referred to in the declaration. Accordingly, the amendments involved are those filed with the application papers or, in the case of a supplemental declaration, are those amendments claiming matter not encompassed in the original statement of invention or claims. See 37 CFR 1.67.

NOTE: "The following combinations of information supplied in an oath or declaration filed after the filing date are acceptable as minimums for identifying a specification and compliance with any one of the items below will be accepted as complying with the identification requirement of 37 CFR 1.63:

"(1) name of inventor(s), and application number (consisting of the series code and the serial number; e.g., 08/123,456);

"(2) name of inventor(s), serial number and filing date;

"(3) name of inventor(s) and attorney docket number which was on the specification as filed;

"(4) name of inventor(s), title which was on the specification as filed and filing date;

"(5) name of inventor(s), title which was on the specification as filed and reference to an attached specification which is both attached to the oath or declaration at the time of execution and submitted with the oath or declaration; or

"(6) name of inventor(s), title which was on the specification as filed and accompanied by a cover letter accurately identifying the application for which it was intended by either the application number (consisting of the series code and the serial number; e.g., 08/123,456), or serial number and filing date. Absent any statement(s) to the contrary, it will be presumed that the application filed in the PTO is the application which the inventor(s) executed by signing the oath or declaration."

Notice of July 13, 1995 (1177 O.G. 60).

(c) ☐ was described and claimed in PCT International Application No. \_\_\_\_\_, filed on \_\_\_\_\_ and as amended under PCT Article 19 on \_\_\_\_\_ (if any).



**SUPPLEMENTAL DECLARATION (37 C.F.R. § 1.67(b))**

*(complete the following where a supplemental declaration is being submitted)*

- ☐ I hereby declare that the subject matter of the
- ☐ attached amendment
  - ☐ amendment filed on \_\_\_\_\_

was part of my/our invention and was invented before the filing date of the original application, above-identified, for such invention.

**ACKNOWLEDGEMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR**

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information, which is material to patentability as defined in 37, Code of Federal Regulations, § 1.56,

*(also check the following items, if desired)*

- ☐ and which is material to the examination of this application, namely, information where there is a substantial likelihood that a reasonable Examiner would consider it important in deciding whether to allow the application to issue as a patent, and
- ☐ in compliance with this duty, there is attached an information disclosure statement, in accordance with 37 CFR 1.98.

**PRIORITY CLAIM (35 U.S.C. §§ 119(a)-(d))**

**NOTE:** "The claim to priority need be in no special form and may be made by the attorney or agent if the foreign application is referred to in the oath or declaration as required by § 1.63. The claim for priority and the certified copy of the foreign application specified in 35 U.S.C. 119(b) must be filed in the case of an interference (§ 1.630), when necessary to overcome the date of a reference relied upon by the examiner, when specifically required by the examiner, and in all other situations, before the patent is granted. If the claim for priority or the certified copy of the foreign application is filed after the date the issue fee is paid, it must be accompanied by a petition requesting entry and by the fee set forth in § 1.17(f). If the certified copy is not in the English language, a translation need not be filed except in the case of interference; or when necessary to overcome the date of a reference relied upon by the examiner; or when specifically required by the examiner, in which event an English language translation must be filed together with a statement that the translation of the certified copy is accurate." 37 C.F.R. § 1.55(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §§ 119(a)-(d) of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

*(complete (d) or (e))*

- (d) ☐ no such applications have been filed.
- (e) ☒ such applications have been filed as follows.

**NOTE:** Where item (c) is entered above and the International Application which designated the U.S. itself claimed priority check item (e), enter the details below and make the priority claim.

**PRIOR FOREIGN/PCT APPLICATION(S) FILED WITHIN 12 MONTHS  
(6 MONTHS FOR DESIGN) PRIOR TO THIS APPLICATION  
AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. § 119(a)-(d)**

COUNTRY (OR INDICATE IF PCT)	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 37 USC 119
FINLAND	982251	16/10/1998	<input checked="" type="checkbox"/> YES    NO <input type="checkbox"/>
			<input type="checkbox"/> YES    NO <input type="checkbox"/>
			<input type="checkbox"/> YES    NO <input type="checkbox"/>
			<input type="checkbox"/> YES    NO <input type="checkbox"/>
			<input type="checkbox"/> YES    NO <input type="checkbox"/>

**CLAIM FOR BENEFIT OF PRIOR U.S. PROVISIONAL APPLICATION(S)**  
(34 U.S.C. § 119(e))

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below:

**PROVISIONAL APPLICATION NUMBER**

**FILING DATE**

\_\_\_\_ / \_\_\_\_\_  
\_\_\_\_ / \_\_\_\_\_  
\_\_\_\_ / \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**CLAIM FOR BENEFIT OF EARLIER US/PCT APPLICATION(S)**  
**UNDER 35 U.S.C. 120**

- ☐ The claim for the benefit of any such applications are set forth in the attached ADDED PAGES TO COMBINED DECLARATION AND POWER OF ATTORNEY FOR DIVISIONAL, CONTINUATION OR CONTINUATION-IN PART (C-I-P) APPLICATION.

**ALL FOREIGN APPLICATION(S), IF ANY, FILED MORE THAN 12 MONTHS  
(6 MONTHS FOR DESIGN) PRIOR TO THIS U.S. APPLICATION**

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NOTE: If the application filed more than 12 months from the filing date of this application is a PCT filing forming the basis for this application entering the United States as (1) the national stage, or (2) a continuation, divisional, or continuation-in-part, then also complete **ADDED PAGES TO COMBINED DECLARATION AND POWER OF ATTORNEY FOR DIVISIONAL, CONTINUATION OR C-I-P APPLICATION** for benefit of the prior U.S. or PCT application(s) under 35 U.S.C. § 120.

**POWER OF ATTORNEY**

I hereby appoint the following practitioner(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

*(list name and registration number)*

Clarence A. Green      Reg. No.: 24,622  
Mark F. Harrington      Reg. No.: 31,686

*(check the following item, if applicable)*

- ☐ I hereby appoint the practitioner(s) associated with the Customer Number provided below to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.
- ☐ Attached, as part of this declaration and power of attorney, is the authorization of the above-named practitioner(s) to accept and follow instructions from my representative(s).

---

SEND CORRESPONDENCE TO

DIRECT TELEPHONE CALLS TO:  
*(Name and telephone number)*

☒ Address

Clarence A. Green  
PERMAN & GREEN, LLP  
425 Post Road  
Fairfield, Connecticut      06430

Clarence A. Green  
(203) -259-1800

☐ Customer Number \_\_\_\_\_

---

## DECLARATION

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

## SIGNATURE(S)

NOTE: Carefully indicate the family (or last) name, as it should appear on the filing receipt and all other documents.

Full name of sole or first inventor

Antero

(GIVEN NAME)

(MIDDLE INITIAL OR NAME)

LUNDELL

FAMILY (OR LAST NAME)

Inventor's signature

Date 6/9 - 1999 Country of Citizenship Finland

Residence Turku, Finland

Post Office Address Rysäkatu 21 B6, 20900 Turku, Finland

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Lars

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(MIDDLE INITIAL OR NAME)

DALSGAARD

FAMILY (OR LAST NAME)

Inventor's signature

Date 3/9 - 1999 Country of Citizenship Denmark

Residence Oulu, Finland

Post Office Address Toivonvientie 9 as 2, 90500 Oulu, Finland

Full name of third joint inventor, if any

(GIVEN NAME)

(MIDDLE INITIAL OR NAME)

FAMILY (OR LAST NAME)

Inventor's signature

Date \_\_\_\_\_ Country of Citizenship \_\_\_\_\_

Residence \_\_\_\_\_

Post Office Address \_\_\_\_\_

(check proper box(es) for any of the following added page(s)  
that form a part of this declaration)

- ☐ **Signature** for fourth and subsequent joint inventors. *Number of pages added* \_\_\_\_\_

\* \* \*

- ☐ **Signature** by administrator(trix), executor(trix) or legal representative for deceased or incapacitated inventor. *Number of pages added* \_\_\_\_\_

\* \* \*

- ☐ **Signature** for inventor who refuses to sign or cannot be reached by person authorized under 37 CFR 1.47. *Number of pages added* \_\_\_\_\_

\* \* \*

- ☐ Added page for **signature** by one joint inventor on behalf of deceased inventor(s) where legal representative cannot be appointed in time. (37 CFR 1.47)

\* \* \*

- ☐ Added pages to combined declaration and power of attorney for divisional, continuation, or continuation-in-part (C-I-P) application.

☐ Number of pages added \_\_\_\_\_

\* \* \*

- ☐ Authorization of practitioner(s) to accept and follow instructions from representative.

\* \* \*

(if no further pages form a part of this Declaration,  
then end this Declaration with this page and check the following item)

☒ This declaration ends with this page.